



ALBUMINURIA

IN CASES OF

VASCULAR, BRONCHOCELE AND EXOPHTHALMOS.

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THAT albuminuria may exist independently of Bright's disease, and be therefore unconnected with any structural change in the kidneys, is a proposition which few physicians, if any, will be prepared to call in question.

No doubt, the presence of albumen in the urine is the most significant feature in the symptomatology of Bright's disease, otherwise there could have existed no warrant whatever for the employment of the term as a synonym for that disease. The use of the expression in this way is however, faulty, and will become more and more unsuitable as the discovery of albumen in the urine, under other circumstances than those which indicate the existence of a grave renal disease in one or other of its different forms, is made. The presence of albumen in the urine as a notable feature in some cases of vascular bronchocele and exophthalmos has been familiar to me for some time; while a very special interest is attached to the circumstances under which the albuminuria has in a few instances been met with.

I have been unable to find any reference to the association of an albuminous condition of the urine with those remarkable symptoms, the union of which characterizes the disease now well known through the writings of Graves, Stokes, Basedow, Begbie, Trousdale, and other writers. This is, I believe, only to be accounted for by the circumstance that the condition of the urine has hitherto in this disease not been made the subject of any careful examination. It will of course be understood that I exclude from this reference the albuminuria of passive renal congestion, which is so often witnessed in cases of heart-disease, and likewise when the primary

vascular impediment is seated in the lungs, and sometimes also in the liver. From this reference I also exclude those instances of vascular bronchocele and exophthalmos in their advanced stages, in which the heart, and, in their turn, not unfrequently the kidneys, have become involved in organic changes. In the latter, dropsy and albuminuria are constantly present, but under these circumstances they are to be properly regarded as symptoms, not of the disease itself, but of those complications which are prone to occur in its course.

The albuminuria incident to cases of vascular bronchocele and exophthalmos in their earlier stages is essentially a temporary albuminuria, and is evidently unconnected with any form of renal degeneration. But although temporary, disappearing as the other symptoms of the disease are either relieved or removed, the albuminuria has generally been considerable in degree, and sometimes even excessive.

In this respect the coagulability of the urine in cases of vascular bronchocele and exophthalmos has presented a remarkable contrast to the temporary albuminuria which is found in certain other diseases. I have indeed never seen so large an amount of albumen in the urine in any other disease, when the cause of the albuminuria was not inflammatory or organic.

My attention having been called to the association of an albuminous condition of the urine with vascular bronchocele and exophthalmos, in the first instance, owing to the existence, in certain cases, of oedema of the feet and ankles, I became satisfied that the association is by no means of infrequent occurrence. I have found albuminuria in a considerable number of the cases which have lately fallen under observation, and it is more than likely that it may have existed in other instances, although unrecognised from causes to which reference will be made. Albuminuria has existed in persons of both sexes suffering from this disease, and has been more common in cases of female than male patients; but when the much greater frequency of vascular bronchocele and exophthalmos among women than men is kept in view, the symptom has been present in a larger proportion of males than females. In some it has been an evanescent symptom, lasting only for a short time, and when so, only present in limited degree. In others, the albuminuria has been very considerable—it has even been excessive, and it has lasted for weeks, indeed for months—while the other notable symptoms of the complex malady continued, and only disappeared as the latter became relieved or removed. Oedema of the lower limbs, although in the first instance calling attention to the condition of the urine, has not been observed to bear any constant relation to the albuminuria; on the contrary, oedema, and sometimes considerable anasarca of the legs, have been present without any appearance of albumen in the urine; and albumen, when present, has generally existed without any form of dropsical swelling. In the most

notable cases of albuminuria in connexion with vascular bronehocele and exophthalmos, dropsy has not been present.

In prosecuting my inquiry on this subject, a very interesting circumstance became manifest, namely, that the albuminuria was in certain cases limited to the period of digestion—present immediately after a meal, and absent when the person fasted. I had in one case been not a little puzzled by noticing the strange variety presented by the urine within very short periods—the albumen present in considerable quantity one day, and absent the next—present in the urine of the forenoon, and not to be detected in that passed before dinner. By obtaining repeatedly specimens of the urine in this case, and in one or two others, I was able to satisfy myself that in this disease the albuminuria is apt to possess the remarkable character of only occurring during or immediately after the digestion of the food.

This appears to me to be a most interesting feature, and it is also in various ways a very important one. The existence of albumen might readily escape detection if the physician relied on the results of one examination, as he is not unapt to do; and even when taking more than usual care, it is quite possible that in several specimens of urine furnished by the same patient for examination it might be found that no albumen existed. Conceive a patient so affected consulting a medical man before breakfast or luncheon; his urine, carefully examined, found to be non-albuminous; but, from some cause or other—and we know how fickle some patients are—calling for another physician shortly after a meal, when a large precipitate of albumen occurred on applying heat as well as on the addition of a little nitric acid. Remarkable as this character of the albuminuria which occurs in cases of vascular bronehocele and exophthalmos is, there is another feature pertaining to it which is even more striking. The albumen is present in much larger quantity after breakfast than after either luncheon or dinner. In one case of this kind, which I was able to observe at intervals for a considerable time, the urine presented the following characters:—It was passed in average amount, was of healthy colour, reaction, and density. On no occasion was the density observed to fall below 1015, and it never rose above 1025; the average density was that of health, 1020. Very occasionally this urine deposited lithates, and from time to time contained a slight excess of earthy phosphates. Sugar was never present. Albumen existed in this urine daily for upwards of a twelvemonth, but only at certain times of the day, and these times were readily found to be shortly after meals. After breakfast, however, the amount of the albumen was invariably greater than after luncheon, dinner, or an evening meal. Being greatly interested in these peculiar phenomena presented by the urine in the case of a gentleman whom I had recommended to spend the spring months in the south of England, I requested him to take an opportunity of consulting Dr George Johnson of London, whose opinion

in all departments of urinary pathology is so deservedly held in high esteem. In connexion with this case, Dr. Johnson wrote to me as follows :—" I saw two days ago a patient of yours, who asked me to write to you. As he told me that the explanation which I gave him of his symptoms is essentially the same as that which you gave him, I need not enter into minute detail in writing to you. I found that the urine passed after his breakfast contained a large amount of albumen ; that passed at 3 P.M. contained none ; that in the evening, three hours after dinner, contained a small quantity. He has been overworked, and is evidently a nervous, excitable man. I conclude that there is no structural change in the kidney, but that his kidney is irritated and congested at intervals during the process of excreting the products of faulty digestion. I confess that I am at a loss to account for the fact of the urine being more constantly and copiously albuminous after breakfast than after dinner. I repeated to him the usual directions as to avoiding cold and wet and fatigue, and long fasting. I also advised him to make trial of an exclusively milk diet. He told me that you had made the same suggestions to him. I prescribed a mixture of tincture of quinine and tincture of nux vomica, acid hydrochloric diluted, and syrup of ginger, to be taken after food, and advised him to take an occasional dose of chloral hydrate when he is restless or disturbed by dreams.

" It occurs to me to ask whether the breakfast taken after a long interval from the previous meal, and when, consequently, the absorption of materials is likely to be more rapid, gets into his vessels quickly, and in a crude and half-digested state ? If this be so, food taken at shorter intervals would seem to be indicated. The urine passed in my room an hour and a half after breakfast became nearly solid with heat and nitric acid. I have often met with cases in which the urine has been albuminous only after food and exercise, but I have not before met with one in which the *breakfast* appeared to be so especially noxious to the kidney."

A brief account of the case to which Dr. Johnson alludes in his interesting communication just quoted, will now be given, before offering certain considerations which its observation has suggested.

A gentleman, of about thirty years of age, had long been in a somewhat delicate state of health, although no particular attention had been called to his symptoms till the summer of 1871. He was then suffering from debility, great nervousness, and palpitation of the heart. These had succeeded a condition of looseness of the bowels, which had existed for a considerable time. The prominence and peculiar expression of the eyes in this gentleman were, at the time now referred to, quite characteristic, and suggested the very probable discovery of a goitre. This, although the patient had been quite unaware of its existence, was readily detected in the form of a soft pulsating tumour on both sides of the neck. The visible pulsation of arteries in the neck and limbs was present

in a notable degree. On examining the urine of this gentleman, it was found to contain a considerable amount of albumen; but speedily the discovery was made that the albuminuria was not persistent, but, on the contrary, variable in its occurrence. The urine passed after meals was found to be more constantly and highly coagulable than that passed while fasting, and at times the urine was found to be free from albumen. Dr Henderson of Helensburgh, under whose care this gentleman had been, had noted the variable character of the albuminuria, and had distinctly traced its occurrence to the periods of digestion. Both before and after this gentleman's visit to the south of England and residence on its coast, rest from professional duties—which, in his case, were arduous—had been enjoined, and various experiments in diet and regimen had been practised. He had also several remedies in addition to those prescribed by Dr Johnson. From bromide of potassium and belladonna he undoubtedly received benefit, but more especially from digitalis. To the latter, indeed—which, in the form of its tincture, he took persistently for months, in doses of from ten to twenty drops thrice daily, frequently combined with iron, and sometimes alone—he has himself ascribed the chief benefit. Under its use the prominent eyes have retired, the goitre has nearly if not entirely disappeared, the cardiac pulsations have fallen from 140 per minute to the normal standard, and the distressing palpitation from which he suffered has been succeeded by calmness in the heart's action. The nervousness and apprehension so characteristic of his malady, and which in his case were often most distressing, have given place to mental calmness and tranquillity. He has become greatly changed for the better in appearance; having been formerly very notably thin, he has now become very fairly nourished. He has returned to his professional duties, and during the past winter has discharged them regularly and comfortably. For months there has been no appearance of albumen in his urine. The last time I had an opportunity of examining the urine, which was passed shortly after breakfast, it contained no trace of albumen. The recovery in this gentleman has been complete.

It is surely a satisfactory consideration that a condition of excessive albuminuria—the urine becoming nearly solid on the application of heat and addition of nitric acid—may, after all, not indicate the existence of any structural change in the kidney. Of course, in connexion with the albuminuria, the presence or absence of certain other important features must, under such circumstances, be taken into account. Apart from the intermittent character of the coagulability, the facts that the quantity and density and colour of the secretion did not deviate from the healthy standard, and still more, that diligent and repeated examination by the microscope failed to detect the vestige of a cast of any kind, were to be regarded as the proofs of the renal derangement being functional and not organic. Still, there is occasion for reiterating the assurance

that albuminuria is not Bright's disease, and for pointing out that, when unconnected with the presenece of blood or pus in it, there may be even a highly coagulable eondition of the urine, due to causes which are wholly independent of any structural change in the renal substance. Such, I am persuaded, may confidently be affirmed of the albuminuria which is apt to occur in eases of vascular bronchocele and exophthalmos.

Some little time after my attention had been called to the peeuliar features of the albuminuria which is incident to eases of vascular bronchocele and exophthalmos, and to which reference has now been briefly made, a very instructive instance of the malady fell under my notice in the person of a medical man, who had been for some years engaged in active practice in the south of England. Calling one day for advice, the gentleman in question told me that he was the subject of Bright's disease, and feared that little or nothing could be done for his relief. He certainly looked ill, was thin and sallow in appearance, and evidently deeply depressed in spirits. Having, however, noticed, as he entered my room for the first time, that he possessed the prominent eyes, with peeuliar staring expression, so characteristic of vascular bronchocele and exophthalmos, I ventured—in reliance on my previous observations—to offer the comforting suggestion, that possibly, if not probably, the presence of albumen in his urine might be due to causes which were capable of being removed, and did not indicate the existence of any serious disease. This remark he received with politeness, but with very evident incredulity, mentioning that his condition had already been condemned by medical authority, that he did not expect to be cured, but only felt justified in expecting a little prolongation of life with greatly impaired health. On carefully examining this gentleman, a bronchocele of considerable size, soft, and pulsating, of whose existence he had been unaware, was discovered. His pulse was small, and as frequent as 140 per minute. The urine, on its earliest examination, while the patient was fasting, and between 1 and 2 P.M., was, to his own surprise, found to be free from albumen, its density 1020, and of acid reaction. Subsequent examinations of the urine determined its decided coagulability after meals, and its freedom from albumen while abstinence from food was practised. This gentleman was exceedingly nervous, and very desponding. Under treatment a considerable improvement took place. As he had occasion to pass through London, I begged him to see Dr Johnson, and it is to him Dr Johnson alludes in a letter of date 27th October 1872, from which I now quote:—“There is a striking resemblance between his ease and that of the Scotch elergyman whom you were so good as to send to me. Dr — is extremely feeble and nervous, and I fear that the prognosis is bad. I quite agree with you, that a long sea voyage would be the best course for him, but he seemed unwilling to do anything that would separate him from his family.” I have not

seen this gentleman for some time, but his progress can be traced in the correspondence I have had with him. On the 28th of March 1873 he wrote :—" I have gone very comfortably through the winter, considering all things. I am much stouter than when you saw me, and much stronger. I do a good deal of walking in the course of the day. My heart still beats very rapidly, but its action is not so irregular as formerly. Whether albuminuria exists, I cannot say, as I never test for it, and try to banish the thought of it altogether from my mind. The goitre is decidedly less in size, but is still visible."

I obtained two specimens of urine passed on the 10th of April 1873. That voided before food was taken, contained deposit of lithates, and was absolutely free from albumen. That passed an hour after breakfast had a density of 1016, and contained a very faint trace of albumen. The letter which accompanied the specimens of urine will exhibit the peculiar nervousness under which my friend still laboured. " I send you," he wrote, " two little bottles with urine which I passed to-day. Please do not send me a bad report, as it will only frighten me. I dread the thought of renal disease so much, that I try to banish the very existence of kidneys from my thoughts. That I shall look with anxiety for your next letter, and yet dread its arrival, your knowledge of my nervous condition will assure you." Happily, I had no occasion to send " a bad report," while, in consideration of his highly sensitive and nervous state, I wrote over the seal of my communication, " good news."

Since the summer of 1873, this gentleman's condition has steadily improved. On the 28th October he wrote :—" I am glad to be able to tell you that my wife was confined on the 27th ultimo, and has done very well indeed. For myself, the only trouble I now have is occasional palpitation." Again, on the 8th December :—" My general health is now very good. I am as fat as ever I was, and my eyes have lost that unnatural stare. There is still a slight enlargement of the thyroid gland, and sometimes—though rarely—my kidneys act very little. Digitalis and iron remedy this. My heart still beats fast." My last communication, of date 17th Jan. 1874, gave a most satisfactory account of his progress, and was written a few days before he embarked as surgeon of a ship sailing with the royal mails for Madeira, Ascension, and the Cape of Good Hope. Before obtaining this appointment, my friend was obliged to go before the medical officer of the General Post-Office for examination as to personal and professional fitness. In this communication he says :—" I find no remedy relieve me so much as bromide of potassium, in 20-grain doses, thrice daily. Aconite and digitalis do not relieve me much."

This case is certainly a very gratifying and encouraging one. Not only has there been an almost entire disappearance of albumen from the urine, but the other symptoms from which the patient

suffered in very notable degree—the palpitation of the heart and throbbing of the arteries, the bronchocele and exophthalmos—have all become very greatly lessened, and will, I fully expect, soon entirely disappear. This hope is justified by the results of experience in other cases. It has occurred to me to witness, within the past two years, three cases of vascular bronchocele and exophthalmos, all in females, in two of which albuminuria existed, gradually improve under the same treatment as that which has been pursued in the instances more fully detailed, and ultimately in these a complete cure has been obtained. In the second patient, whose case has been narrated at some length, renal casts were said to have been seen. This may very possibly have been so, but repeated careful examinations of the urine, made while he remained under my care, failed to detect their presence. I have, indeed, in no instance of the albuminuria occurring in cases of vascular bronchocele and exophthalmos, found renal casts. This remark applies equally to the examples of excessive albuminuria, and the more numerous instances of the disease in which the coagulability of the urine has neither been great nor long-continued. Albuminuria is not a constant symptom of vascular bronchocele and exophthalmos, but it is a frequent one. I am inclined to think that it may hereafter be found a more frequent symptom than my own observations presently entitle me to call it. From the circumstance that I have had no opportunity of carefully watching some instances of vascular bronchocele and exophthalmos which have recently fallen under my notice, having in such been able to make an examination of the urine only on a solitary occasion, it is very probable that albuminuria may have escaped detection. It existed in a patient of Dr Rosa, whom I saw lately, a married woman, æt. 36, the mother of seven children, in whom the malady succeeded the occurrence of lenteric diarrhoea and prolonged lactation. Dr Affleck informs me that he has found albuminuria, of the nature I have been describing, to exist in a sufferer from vascular bronchocele and exophthalmos recently under his care.

Having indicated the nature of the albuminuria which is found in certain cases of vascular bronchocele and exophthalmos, it now becomes necessary to inquire a little more fully into its pathology. Albumen is, in all probability, not a constituent of healthy urine. It has, indeed, been stated by Dr Gigon of Angoulême, that albumen exists in normal urine, and can be thrown down by chloroform. Becquerel, Aran, and Parkes have satisfied themselves that the precipitate which is produced by the addition of chloroform to the urine is not albumen, but a mixture of chloroform, mucus, and organic substances. Albumen, however, is so frequently present in the urine, and occurs under so vast a variety of circumstances, that it becomes a matter of very great importance to determine its clinical significance. The existence of blood, pus, or spermatic fluid in the urine renders it coagulable; but it is scarcely necessary to state

that, in the cases of vascular bronchocele and exophthalmos to which I have referred, there were none of these conditions. Again, the excessive use of a diet composed chiefly or entirely of albuminous matter, such as eggs, has been found by various observers—among others, Barreswil, Hammond, and Brown-Séquard—to produce albumen in the urine. Barreswil, after taking ten eggs, passed albuminous urine for twenty-four hours. There can be little doubt that, in some persons peculiarly constituted, the partaking of certain articles of food difficult of digestion by them, produces albuminuria for a time. Of this nature was the case of the student mentioned by Sir Robert Christison, in whom a large amount of cheese or pastry produced albumen in the urine. Apart, however, from errors of diet, as Dr Parkes has stated, temporary albuminuria will occur in persons with very slight disease. Beneke, when suffering from dyspepsia, noticed albumen in his own urine four times in four weeks. Clemens, Rayer, Martin Solon, and many other physicians, have made similar observations. It may be admitted, then, that albumen, although not an ingredient of healthy urine, may occur in the urine of healthy persons, or of persons whose disorder of health is, at the time of its presence, very slight. Attention has recently been called by Dr George Johnson to the occurrence of albuminuria in healthy persons after bathing in cold water. Again, albuminuria is apt to occur in relation to a great many disorders which are not essentially connected with structural change in the kidneys. Not to dwell upon pregnancy, as a condition of the system with which albuminuria is associated, there is the puerperal state. Again, there is a large number of febrile and inflammatory diseases in the urine of which albumen very often occurs. Among these may be mentioned scarlet fever, measles, erysipelas, smallpox, diphtheria, typhus and typhoid fever, cholera, etc., and, of inflammatory diseases, pneumonia. Over and above these relationships, there are various forms of visceral disease—of disease affecting the heart, liver, and lungs—in the urine of which albumen appears; and the physician, in his observation of such cases, is on the outlook for its occurrence, and ascribes it, when it does come, to the general impediment to the circulation which the following diseases—(I name them as illustrative examples only) dilatation of the heart, cirrhosis of the liver, emphysema of the lungs—produce; for, owing to these, the renal circulation necessarily suffers. In such diseases, the albuminuria is almost invariably associated with a diminished secretion of urine. It is not necessarily so in the albuminuria of vascular bronchocele and exophthalmos,—the quantity is generally unaffected, and so are the other characters of the urine.

Dr Roberts of Manchester has very clearly pointed out, that, in endeavouring to determine whether the presence of albumen in the urine be dependent upon the existence of organic disease of the kidneys or not, the question in each individual case must be considered in connexion with the three following points:—1. The temporary

or persistent duration of the albuminuria; 2. The quantity of the albumen present, and the occurrence and character of a deposit of renal derivatives; 3. The presence or absence of any disease outside the kidneys which will account for the albuminuria.¹

Now, viewing the albuminuria of vascular bronchocele and exophthalmos under these aspects, the following observations may be made:—1. The albuminuria is temporary; for, according to Dr Parkes's definition of that condition, it has totally disappeared while the patient is under observation; but, instead of lasting a few days or weeks, as holds true of most instances of temporary albuminuria, properly so called, it has lasted for many months, indeed for a year. Intermittent or remittent albuminuria would be a better signification than temporary, for the albuminuria of vascular bronchocele and exophthalmos, but, better still, because more definite, albuminuria occurring during or after digestion. 2*d*, The amount of albumen which is present in the urine when the cause of its manifestation is independent of organic or inflammatory disease is usually small; very often it is not more than a mere trace. The amount of albumen in the urine when passive congestion of the kidneys results from cardiac or other visceral disease may indeed be considerable, but I do not remember ever to have seen the urine under such circumstances very highly coagulable; very highly or excessively albuminous has, however, been the character of the urine in at least one example of vascular bronchocele and exophthalmos, the recovery in which has been complete. Again, in the temporary albuminuria of other maladies, there is generally some deviation, often notable, from the normal condition of the urine in other respects; the quantity, density, and reaction of the urine are often affected; and there is the presence of lithates in excess, or an undue amount of earthy phosphates. Not so, generally at least, in the cases of vascular bronchocele and exophthalmos which I have seen. With the exception of its containing albumen in considerable or large amount, the urine has been healthy. Neither has there been in the latter any deposit derived from the kidneys. In this respect, indeed, there is the interesting fact of a copious presence of albumen in the urine, without any trace of casts of one kind or another, and without any renal epithelium or blood. Further, the form of albuminuria which we are now considering, differs from any other form hitherto described, in being limited to the period of digestion of the food. 3*d*, The presence of disease apart from the kidneys is of course conspicuous in vascular bronchocele and exophthalmos, while the peculiar morbid condition of the nervous system and of the bloodvessels in that disease, as well as the spanæmia which exists, must, I think, be taken into consideration in our endeavour to determine the pathology of the albuminuria, which we now know to be in some way or other associated with it.

In vascular bronchocele and exophthalmos, there is always present

¹ On Urinary and Renal Diseases, 2d edition, page 172.

much disturbance of the nervous system—the sufferers from this disease are invariably highly nervous—they are often hysterical. The primary disorder of the circulation, both cardiac and vascular, is of the nature which we associate with derangement of the nervous system. The organs and parts of the body in which the local manifestations of disturbance are seated, are organs and parts freely supplied with bloodvessels and blood,—the thyroid gland, the spleen, which, although not invariably, is often affected, and the deep ocular tissues. To these must be added the kidney. From the failure of due nervous influence, the small vessels, and, it may be presumed, the capillaries, in the thyroid gland, and the deep-seated orbital vessels, become dilated, and the circulation through them in consequence interfered with. We can infer from the consideration of the essential nature of the renal circulation that if an obstruction to the return of blood through the inter-tubular capillaries and veins exists, either from an obstruction in the heart or lungs, or from a disordered state of the vessels themselves—a condition which I believe to exist in vascular bronchocele and exophthalmos—favoured by the more or less watery state of the blood itself, there will occur a transudation of serum, carrying with it albumen, through the walls of the Malpighian capillaries into the tubes, and thus the urine will be rendered coagulable.

But in order to explain the limitation of the albuminuria to the period during and after digestion of the food, it is necessary to regard the increased afflux of blood which then takes place, as leading to an altered physical relation between the blood and the walls of the vessels, and likewise determining an engorgement of the Malpighian capillaries, while the loss of tonicity in the efferent vessels is thus rendered temporarily more injurious. In other words, the renal circulation, in its comparatively tranquil condition, is unaffected by the disordered state of the capillaries and small vessels; but, when excited by the stimulus of a recent meal, it is unequal to the task, and the resulting interference determines the albuminuria.

But, further, there is something in the character of this albuminuria to ally it with the albuminuria of indigestion, to the occurrence of which a brief reference has been made. Sufferers from vascular bronchocele and exophthalmos have frequently an inordinate appetite and craving for food. They have bulimia; and, in the cases I have shortly recorded, this symptom was notably present. A large meal taken hurriedly is not unlikely to influence, as a remote cause, the production of the albuminuria. I think Dr Johnson's explanation of the greater amount of albumen in the urine after breakfast than dinner, may be correct—the same explanation had occurred to my own mind—that the earlier meal taken after a long fast gets into the bloodvessels quickly, and in consequence leads to a greater disturbance of the renal circulation. Besides, hot tea and coffee, with eggs, consumed at breakfast, may

be presumed to be articles more likely than others to furnish to the blood the offending material.

I have not attempted to exhaust this interesting subject, but have for the present limited myself to pointing out the occurrence of a form of albuminuria which, so far as I am aware, has not in its details been previously described by any observer, namely, albuminuria occurring during and after digestion in cases of vascular bronchocele and exophthalmos.

